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SPECIFICATION

INVENTION: BRAZED CONDENSER FOR AN AIR CONDITIONER

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BRAZED CONDENSER FOR AN AIR CONDITIONER

This application claims the priority of German application 198 48 744.4, filed October 22, 1998, the disclosure of which is expressly incorporated by reference herein.

BACKGROUND AND SUMMARY OF THE INVENTION

5. The present invention relates to a brazed condenser for an air conditioner, such as a motor vehicle air conditioner, having a block of tubes and fins arranged between two collecting tubes, and with a tube-shaped collector which is mounted laterally on one of the collecting tubes.

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In one such condenser known from U.S. Patent 5,159,821, the condenser is assembled and then brazed in a furnace. In order to hold the parts of the condenser together, particularly the collecting tube formed of two half shells, and also to connect 15 this collecting tube with the tube-shaped collector, molds must be provided to hold the condenser in the preassembled condition until the condenser is brazed.

It is also known from German Patent Document DE 195 36 999 20 A1 to hold the two-part collecting tube together with a collector molded of a plane steel sheet bar, as a result of a plastic deformation of elements, such that they can be brazed to one another in a furnace.

5 It is also known from European Patent Documents EP 689 014
A1 and EP 0 669 506 A1 to provide an extruded tube as a collector
which is provided on the outside with profile strips extending
in the longitudinal direction and forming a collecting tube
together with a half shell. These elements are also joined into
10 a preassembly and are then brazed in a furnace. Joining must
take place very carefully, while handling of the condenser during
transport to the brazing furnace must also be carried out very
carefully so that the parts do not slide with respect to one
another; this could impair tight soldering.

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It is an object of the invention to simplify a condenser of
the initially mentioned type, particularly with respect to the
design of the collecting tube and the collector, and to ensure
that these parts are also securely connected with one another
20 before a brazing in a brazing furnace.

This object is achieved by prefabricating the collecting
tube as a one-piece tube which is connected with the collector
by tack weld seams.

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The use of a one-piece collecting tube is advantageous since
the tube already has its final shape so that no parts can be
displaced with respect to one another. Furthermore, tack weld
seams can be made in a simple manner between the one-piece

5 collecting tube and the collector and provide sufficient stability until final brazing-together.

In an advantageous further development of the invention, the tack weld seams are constructed as laser weld seams. Such 10 laser weld seams have the advantage that the introduction of heat into the collector and into the collecting tube is relatively low so that thermal deformations which may impair subsequent tight brazing are not to be expected.

15 In a further development of the invention, at least one of the tubes is provided with a plastic deformation for forming a contact surface for the other tube. In an advantageous further development, at least one connection opening between the two tubes is provided in the area of the deformation. Flat contact 20 in the area of the plastic deformation ensures that the area of the connection openings is reliably tightly brazed toward the outside.

In a first embodiment of the invention, the tube of the 25 collector is extended by a coaxial tube piece which is provided on the outside with a longitudinal groove forming a contact surface for the collecting tube. The use of such a coaxial tube piece permits the provision of a secure contact surface. In a further development, the coaxial tube piece is provided with an 30 internal thread for receiving a plug. The coaxial tube piece,

5 therefore, also functions to make a sufficient wall thickness available for providing an internal thread for a plug.

Additional characteristics and advantages of the invention will be clear from the following description of the embodiments
10 illustrated in the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an axial sectional view of a collecting tube and a collector of a brazed condenser;

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Figure 2 is a sectional view along line II-II of Figure 1;

Figure 3 is a sectional view along line III-III of Figure 1;

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Figure 4 is a partial axial sectional view of another embodiment of a collecting tube and of a collector of a condenser; and

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Figure 5 is a sectional view along line V-V of Figure 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A condenser, which is only partially shown in Figure 1, has a collecting tube 10 which is a one-piece, preferably welded 30 round tube. The collecting tube 10 is provided at regular

5 distances with passages 11 which are used for accommodating flat
tubes. Normally, so-called corrugated fin plates are arranged
between the flat tubes. The opposite ends of the flat tubes,
which are not shown, are fitted into passages of a mirror-
invertedly arranged collecting tube. On the top and on the
10 bottom, the collecting tube 10 is closed by closing lids 12 which
are inserted in a force-locking manner. At defined distances,
the collecting tube 10 is provided in the axial direction with
partitions 13. Additional partitions are also assigned (at
15 different axial distances) to the opposite collecting tube, which
is not shown. These additional partitions, in connection with
the partitions 13, cause the refrigerant to flow through the
condenser in a meandering manner.

The flat tubes, the corrugated fins, the collecting tubes
20 10, the partitions 13 and the lids 12 are plated with a material
appropriate for brazing so that they can be brazed to one another
in a furnace, particularly by way of what is known as the Nocolok
process. Next to the collecting tube 10, and parallel thereto,
25 a collector 14 is arranged which receives a cartridge 15 which
contains dryer granulates and, in addition, acts as a filter
screen. Between the collecting tube 10 and the collector 14,
connection openings 16, 17 are provided above and below the
lowest partition 13. Between the two openings, the cartridge 15
is provided with a sealing ring 18 resting on the inside against
30 the collector 14, so that the refrigerant, which is already

5 virtually completely liquified in this area, will necessarily
flow through the cartridge 15.

The collector 14 is formed by a round tube, such as a welded
round tube, which is lengthened by means of a tube piece 19 in
10 the area of its lower end.

In the area of its upper end, the collecting tube 10 is
provided with a preferably hydraulically made recess 20 which
extends over a relatively short axial length. This recess is
15 rounded in a groove-shaped manner so that it forms a contact
surface for the exterior side of the tube-shaped collector.

The tube piece 19 has a larger outside diameter than the
welded tube of the collector, onto the lower end of which the
20 tube piece is pressed by way of a ring shoulder. The tube piece
19 defines an extruded profile, as illustrated particularly in
Figure 3. On its exterior side, the tube piece has a
longitudinal rib 21 which forms a longitudinal groove the outside
of which is adapted to the outer circumference of the collecting
25 tube 10. The radial depth of the recess 20 and the radial
dimension of the tube piece 19 and of the longitudinal rib 21 are
coordinated with one another such that the collecting tube 10 is
arranged parallel to the tube-shaped collector, in which case the
collecting tube rests flatly in the area of the recess 20 and in
30 the area of the longitudinal rib 21. In this manner, an

5 insulating air gap 29 is left along the predominant length of the
collector 14 and the collecting tube 10. As a result, heat
transmission from the condenser to the collector 14 is limited
so that it is less likely that, because of such heat transport,
already liquid refrigerant will be evaporated again in the
10 collector 14. This insulation can still be improved if the air
gap 29 is filled with heat-insulating material, such as glass
fiber mats.

The collecting tube 10 and the collector 14 are placed on
15 one another and aligned in a clamping device. They are then
connected with one another by tack weld seams 22, 23 in the area
of the recess 20 and in the area of the longitudinal rib 21,
which preferably consist of short laser weld seams.
Subsequently, the collector 14 and the collecting tube 10 are
20 fixedly connected with one another such that they can easily be
removed from the clamping device and transported to a brazing
furnace.

At its lower end, the tube piece 19 is provided with an
25 internal thread 24 into which a plug 25 is screwed which has a
corresponding external thread. The cartridge 15 is locked with
this plug 25 so that, after releasing the plug, it can be pulled
out of the collector 14 and also does not move upwards during
normal operation within the collector 14. The upper end of the
30 collector 14 is closed by a brazed-in closing lid 26. The

5 collector 14 and the tube piece 19 are plated with a material appropriate for brazing like the collecting tube 10 so that tight brazing is achieved in a brazing furnace, particularly in the area of the connection openings 16, 17.

10 In the embodiment according to Figures 4 and 5, the collector 14' has the form of a round tube which is continuous along its whole length and is preferably welded. The collecting tube 10' rests against this round tube of the collector 14' along a surface line. In the areas of the connection openings 16', 15 17', the collecting tube 10' is provided with a recess 27 which forms a longitudinal groove adapted to the outer contour of the collector 14'. In the area of this groove, the collecting tube 10' and the exterior tube 14' rest flatly against one another. Also in this embodiment, the collecting tube 10' and the 20 collector 14' are joined in a clamping device and are aligned with respect to one another and are then tack-welded with one another by short laser weld seams. These laser weld seams may be provided at any point because the collecting tube 10' and the collector 14' contact one another along a surface line over the 25 whole length.

A sleeve 28 is inserted into the lower end of the collector 14' and is later brazed in. The sleeve 28 is provided with an internal thread 24' into which a plug 25 can be screwed by its 30 external thread.

5 In a modified embodiment, a longitudinal groove is recessed
into the collecting tube 10' on the side facing away from the
passages 11, which longitudinal groove is adapted to the outside
diameter of the tube of the collector 14'. Since, in this case,
the collector and the collecting tube also rest against one
10 another, tack welding can also be established here in a simple
manner by weld seams using laser welding before brazing.

The foregoing disclosure has been set forth merely to
illustrate the invention and is not intended to be limiting.
15 Since modifications of the disclosed embodiments incorporating
the spirit and substance of the invention may occur to persons
skilled in the art, the invention should be construed to include
everything within the scope of the appended claims and
equivalents thereof.